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THE NEW YORK CANALS¹

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In the great revival of interest in internal waterways, it is significant, though not surprising, that the first work of great importance has been undertaken by the same state that inaugurated the internal improvements of the early nineteenth century by the construction of the first Erie Canal. Ninety years ago work had been commenced on what then seemed the stupendous project of De Witt Clinton, the result of which was to establish the commercial supremacy of New York City and to make the State of New York the most populous and richest state in the Union. Until forty years ago, the Erie Canal remained the all-important transportation route between the Great Lakes and the Atlantic. Since then, the canal traffic has declined in amount, and its relative importance has dwindled to a small fraction of its former significance. But there are reasons for believing that a considerable part of this decline has been due to the failure to improve the canals to meet the needs of modern conditions, and the State of New York has now undertaken the construction of a new barge canal system, which it is expected will meet the conditions of to-day and bring about a notable revival of water transportation across its territory.

An account of the recent history of the New York canals should be of service in any discussion of American waterways. And it is proposed in this paper to examine the later period of canal traffic, the causes of its decline, the plans for the new water routes, the present status of the construction work, and the probable effect on transportation, commerce and industry.

From the time of their construction until after the last third of the nineteenth century had begun, the New York canals held undisputed their position as the main transportation route from the lakes to the seaboard. As late as 1862 the ton-mileage of canal

¹Cf. for fuller details articles in the *Quarterly Journal of Economics* XIV, 212 (February, 1900), and XVIII, 286 (February, 1904).

traffic was more than double the combined ton-mileage of the New York Central and the Erie railroads. And in 1866 the canal traffic comprised 60 per cent of the freight movement across New York State.

It is in the development of internal commerce since the Civil War that the decline of the canals is to be traced. As early as 1863 we may notice a decline in the flour traffic on the canals; but the other important items showed no falling off at that time, and, indeed, showed an upward movement in the years of expanding business from 1866 to 1873. But the railroads were now securing a share of the bulk commodities; and their freight traffic as a whole was growing at a much more rapid rate than the railroads.

In the years of depression following 1873, canal traffic began to show a positive reduction in volume. In 1876, but 4,172,129 tons were moved on all the canals, less than two-thirds of the traffic for 1872. The railroads, however, continued to develop their traffic, and in 1876 carried a total tonnage of 14,983,600 tons, more than three times the aggregate canal tonnage.

For the next few years canal traffic showed signs of revival, reaching a total of 6,437,656 tons in 1880. As some of the branch canals had now been discontinued, the tonnage for 1880 was, in fact, larger than the aggregate for the same canals in any former year. But this movement was only temporary, and by 1882 the total canal traffic was about 16 per cent below the maximum figure for 1872; while during the same decade railroad traffic had doubled, and the railroad proportion of grain receipts at New York had increased to 63 per cent.

In 1882 canal tolls were abolished, and the canals became free waterways, maintained by the state from general taxation. But this change did not produce any marked effects on the traffic, which remained at about the figures for 1882 until the end of the decade, while railroad traffic continued to increase. From 1890 to 1895 the canal traffic again declined to a notable degree, from 5,370,000 tons to 3,500,000 tons. Since then the tonnage has been approximately stationary, reaching a minimum of 3,138,000 tons in 1904, but rising again to 3,540,000 tons in 1906. Meanwhile, however, the aggregate freight tonnage on the New York railroads has continued to increase, until it has reached the enormous volume of over 100,000,000 tons, compared with which the canal traffic is insignificant.

Viewing the whole period from 1868 to 1906, the total canal traffic has declined from 6,442,000 tons to 3,540,000 tons. Of the several canals, the decrease in traffic has been most marked on the branch canals, discontinued in 1877, and on the Oswego Canal. The Champlain Canal has maintained its traffic to a larger degree than the others, having a tonnage of about 800,000 tons a year, compared with 1,120,000 tons in 1868. The Erie Canal has now approximately 2,000,000 tons a year, as against 3,346,000 tons in 1868.

When the canal traffic is compared with the railroad traffic, the decline of the former in comparative importance is unmistakable. While as late as 1869 the canal traffic, measured in ton-miles, was equal to the aggregate railroad traffic across the State of New York, at present the canal traffic is less than four per cent of the railroad traffic, and is less than one-tenth of the freight tonnage on either the New York Central or the Erie railroad.

The factors which have brought about this decline in canal transportation are, as usual in economic development, many and complex; and the different factors have been of widely varying importance. In respect to some important items of traffic—lumber and forest products, iron ore and coal—the change has been due largely to changes in the sources of supply,—the geographical relations of the raw materials and the markets being better suited to other lines of transportation than across the State of New York. With regard to other commodities—live-stock, fresh meats and highly manufactured goods—the rapidity of railroad, as compared with canal transportation, gives the former an unmistakable advantage. So far as these factors account for the changed conditions, they indicate a permanent advantage of the railroad over the water routes. But they do not give a complete explanation of the expansion of railroad traffic or the decline in canal traffic.

The decline in grain traffic on the canals, both in actual amount, and still more in the percentage of receipts at New York, cannot be explained by geographical changes in the source of production nor the importance of rapid transportation. The increase in receipts at Buffalo and New York—although less in recent years—shows that the route across the State of New York is still the most important for this traffic; and the decline of canal traffic here is due directly to the competition of railroads travers-

ing the same section as the canals. This competition has been possible because of the reduction of rail rates until they at times have been almost as low as those on the canals; and it has been urged that this situation demonstrates that even for bulky commodities, where there is no need for special haste, the railroads can permanently offer practically as low rates and better service than the canals, and thus offer superior accommodations for all classes of traffic.

Further investigation, however, shows that while, during the past forty years, the railroads have made constant and large improvements, both in their physical condition and in their methods of administration, the canals have in both respects remained practically at a standstill. The road beds of the railroads have been completely rebuilt, permitting the use of larger cars and more powerful locomotives, increasing manifold the trainload units and reducing to a corresponding degree the expenses for each ton carried. At the same time the railroad lines have been consolidated under the control of large corporations, which reduce the expenses of general management and permit more economical methods of business management on a large scale.

On the other hand, no permanent improvements of any importance have been completed on the canals for more than forty years; while in many respects they are practically the same to-day as when first constructed. The same style of boats and the same system of animal towage have been in use since the first canal was constructed; and the size of the locks and canal prism, which limit the size of the boats, has remained unchanged since the completion of the former enlargement in 1862. And the traffic on the canals continues to be handled by single boatmen or small companies, owning at best but a few boats, with too little capital to make use of labor-saving devices, or to furnish terminal facilities, with no organized methods of securing business, and without sufficient financial standing to encourage the patronage of large shippers.

From these considerations it seems clear that the decline of canal traffic has been largely aided by the failure to improve the canals to keep pace with the railroads. And it is at least worth while to examine the possibilities of a revival of water traffic, if the physical condition and business methods of the canals were brought to a modern basis.

In 1899, Governor Roosevelt, of New York, appointed a committee of prominent business men and practical engineers to undertake such an investigation, and to formulate definitely the future canal policy of the state. And it is the recommendations of this committee, presented to the state legislature in 1900, which form the basis of the new barge canal project that is now under construction. The report of the committee emphatically opposed the abandonment of the canals, and doubted the expediency of a ship canal, which in any case would be a work for the national government. After the study of various projects the committee urged the construction of what would be practically a new series of canals and waterways, with important changes from the old routes, which should be navigable by steam-towed barges drawing ten feet of water and having a capacity of at least a thousand tons, or four times that of the largest boats that could use the existing canals. Preliminary estimates of the cost were also presented.

This report was followed by an exhaustive study of the engineering features of the project and the preparation of more detailed estimates by the state engineer and surveyor, which were submitted to the legislature in 1901, showing a total estimated cost of \$101,000,000. Had Mr. Roosevelt continued as governor, energetic efforts would probably have been made to secure further action at that time. But his successor, Governor Odell, was not prepared to urge the matter; and not until April, 1903, was a statute passed, providing for an issue of bonds to the amount of \$101,000,000 for the new canal plans, if approved (as required by the state constitution) by popular vote. After an active campaign the election in November was in favor of the work by the decisive vote of 673,010 to 427,698.

The scheme thus authorized has usually been called one for canal enlargement or canal improvement; but these terms fail to indicate fully the character of the work. More than one-half of the new water routes will be through river channels and lakes, and the canal work involves the construction of entirely new channels and locks, in many places along different routes from the present canals. On the principal route, or the Erie Canal, from Lake Erie to the Hudson River, the new channel will follow the line of the old canal, in the main, from the Niagara River, at Tonawanda, to the neighborhood of Lyons. Thence it takes a new

route to the south of the Montezuma marshes, and in the Seneca and Oneida rivers and across Oneida Lake. Thence it crosses to the Mohawk River west of Rome, and then utilizes the bed of that river for most of the distance to Waterford on the Hudson. The new route removes the canal from the business districts of Rochester and Syracuse, but furnishes each of these cities with larger and better facilities for water traffic in the Genesee River and Lake Onondaga. The most important changes of level are at Lockport and Waterford. At the former a flight of two locks will replace the five now used; and at the latter, five locks, with a fall of thirty-four feet each, will take the place of the sixteen in the neighborhood of Cohoes on the old canal.

In addition to this main line, the Oswego River will be canalized from its junction with the Erie canal route to Lake Ontario, furnishing a waterway from that lake to the Hudson with only thirty-five miles of canal. The Hudson River will also be made navigable from Troy to Fort Edward; and from there a new channel will follow the line of the Champlain Canal to the lake of that name.²

On all of these routes a channel with a minimum depth of twelve feet is to be constructed. On river sections the minimum bottom width will be 200 feet; on canal sections 75 feet. The locks, which are the principal factors in limiting the size of the vessels will be 328 feet in length and (by the latest plans) 45 feet in width. These will permit the passage at one time of two boats, each 150 feet long, 42 feet wide and drawing 10 feet of water, with a capacity of 1,500 tons; and such barges will be the most economical unit for transportation on the new routes. The size of the barges and the location of so much of the new routes in open water courses involves the disappearance of the primitive system of horse towage, and will make necessary the use of steam or other mechanical motive power. It is expected that vessels will usually go in fleets of four, one steamer towing three barges.

²STATISTICS OF NEW CANAL ROUTES.

	<i>River and Lake.</i>	<i>Canal and Locks.</i>	<i>Total.</i>
	<i>Miles.</i>	<i>Miles.</i>	<i>Miles.</i>
Erie Canal	174.83	167.83	342.66
Oswego Canal	18.04	4.80	22.84
Champlain Canal	38.18	28.16	66.34
Total	231.05	200.79	431.84

And under these conditions it is estimated that the trip from Buffalo to New York can be made in five days, in place of ten days as at present.

The estimates previously made covered in detail everything necessary for the construction operations, including not only excavation, locks and dams, but also bridges, harbors at Rochester and Syracuse, water supply, and navigation buoys and lights. The statute of 1903 authorized the letting of contracts, and directed the comptroller to issue bonds as needed for making payments. Careful provisions were made to secure public competitive bidding, and otherwise to prevent any mismanagement in connection with contracts. The governor was authorized to appoint a board of five expert civil engineers to advise the state officers during the progress of the work.

Following the popular vote, work was begun on the detailed specifications for contracts. Then bids were called for, and the first six contracts were made in April, 1905. Since then this work has been steadily continued. In December, 1907, contracts had been let covering 130 miles of the new routes, including twenty-eight locks and fifteen dams (out of a total of sixty-eight locks and thirty-three dams to be constructed), and aggregating \$23,-000,000. These contracts have been for the most part at lower prices than the estimates of 1900; and the prospects are thus good for completing the work within the total estimated cost. The largest stretches of the new routes contracted for are one on the Champlain Canal from Northumberland to Fort Edward, and on the main route along the Seneca and Oneida rivers. But plans and detailed specifications are practically completed for contracts to cover most of the remaining sections.

Construction work on the contracts already let is well under way, and several locks, including one of the largest locks near Waterford, are approaching completion. But scarcity of labor has delayed operations; and it will probably be at least six or eight years before the completion of the whole plan can be expected.

As to the probable results of this new canal system, only general estimates can of course be made. It has been calculated, however, that the cost of transportation in barges built for the new route will be less than twenty-five cents per ton, or below half a mill per ton mile, far below the cheapest railroad rates. The

capacity of the canal will be about 30,000,000 tons a year; and on that tonnage the saving in cost of transportation as compared with the present canal would be \$18,000,000 a year. Even with less than half the maximum tonnage, the direct saving will make possible a reduction in charges for transportation that will much more than offset the cost of the new undertaking.

But the direct reduction in the cost of transportation will be but a small part of the advantages from the new canals. And the indirect advantages, which cannot be even vaguely measured, will form by far the greatest economic gain, both to the State of New York and the country at large. Some of the tendencies that will be promoted may be at least indicated in a general way.

It is almost self-evident that the lower rates of freight by the new routes will prevent further diversion of the export trade in breadstuffs from New York, and will probably regain much of the trade already diverted to other ports, and re-establish the undisputed preeminence of New York in the export trade.

Of even greater importance are the possibilities in connection with the iron and steel industry. The raw materials can be laid down at Buffalo as cheaply as at Pittsburg,—the higher price for coal and coke at Buffalo being offset by the saving of rail haul of ore from Lake Erie points to Pittsburg. With an adequate waterway to the seaboard, iron and steel from Buffalo furnaces can be laid down for one-fourth of the present cost of carriage from the furnaces to the Atlantic. Opportunities will thus be offered for promoting the industrial development of western New York, for making New York harbor the distributing center for iron and steel products to the markets in the immediate vicinity, in New England and in foreign countries, and for developing on the Hudson River a large ship-building industry. It is not too much to say that the possibilities in these directions justify the comprehensive plans for the new canals fully as much as the prospect of transporting grain justified the construction of the first Erie Canal.

Nor is it impossible that, with the low rates of freight by the new canals, it will be found cheaper to ship west-bound coal by the indirect canal route than by the more direct railroad routes; and a large east-bound trade in bituminous coal to the manufacturing districts of New England may also be developed. Still more, it is at least probable that with the water routes now under con-

struction, regular lines of steamers can be operated at as great a rate of speed as freight trains, and secure no inconsiderable amount of package freight business.

And to conclude, the large barges in the new canal routes will easily be able to traverse Long Island Sound to New England ports, and to make journeys to the Delaware and Chesapeake Bay,—a prospect which opens up almost unlimited possibilities for through water transportation from the lakes to these distant regions.